Montana Department of Fish, Wildlife and Parks
Fisheries Division

Job Progress Report

State	Montana	Study Title	Investigation of Major Important Waters
Project No.	F-12-R-26 & F-12-R-27	Job Title	Georgetown Lake Management Survey
Job No.	II-b		

Period Covered: July 1, 1979-June 30, 1981

Abstract

Catch rates averaged 0.7 and 1.1 fish/hour in the summer and 4.7 and 2.2 fish/hour in the winter during 1979 and 1980. Surveys of anglers showed that a large majority of fishermen preferred to maintain the current management plan for rainbow trout with an annual spring plant of 250,000 fish and daily limits of 10 trout.

Kokanee caught by fishermen continued to decline in size due to high densities. Daily limits were removed, the snagging season was extended, and a barrier was installed on the spawning tributary in response to the stunting. Summer growth rates for adult salmon tripled under the new regulations.

Spawning runs were monitored but attempts to establish abundance indices were unsuccessful.

A moderate decline in winter dissolved oxygen levels was measured in 1980-81. A severe oxygen depletion was measured in 1979-80 but with no apparent adverse effects to the fishery.

Several disease outbreaks were investigated including one that killed 5,000 to 10,000 game fish.

Background

Georgetown Lake is a shallow 2,788 acre lake located at an elevation of 6,429 feet, approximately 12 miles west of the city of Anaconda. The lake lies between the Flint Creek and Pintler Mountain ranges. Georgetown was the third most heavily fished lake in the state in a 1975-76 statewide mail creel census and probably still receives more fishing pressure per acre than any other lake in the state. Approximately 250,000 sub-catchable rainbow trout are planted each spring while kokanee (salmon) and brook trout are self-sustaining. Sportfishing harvest probably exceeds 300,000 game fish each year with rainbows dominating the catch although kokanee have steadily increased in the harvest in recent years.

Objectives and Degree of Attainment

The objectives of the study were:

1. To measure the characteristics of angler harvest of game fish.
2. To measure annual rates of growth and mortality for rainbows and kokanee.
3. To measure the effects of reduced fish plants on rainbow growth.
4. To measure the average lengths of spawning kokanee and brook trout. To initiate abundance index measurements on spawning runs and to delineate the effect of water level fluctuations on kokanee recruitment.
5. To monitor dissolved oxygen levels in the lake during periods of ice-cover.
6. To determine angler preferences for management alternatives for rainbow trout management.

All of the objectives were attained.

Procedures

Individual anglers were contacted during the summer and winter fishing seasons to obtain information on angling effort and success. Scales were taken from game fish along with length and weight data.

Game fish were also captured by night electrofishing using a boom shocker with a Coffelt VVP-15 electrofisher unit powered by a 220-volt generator.

Age and length data for spawning kokanee and brook trout were gathered by electro-fishing Smart Mill Bluck and the North Fork of Flint Creek with a Smith-Root D.C. backpack shocker.

Dissolved oxygen was measured during periods of ice-cover at standardized sites on the lake using a Yellow Springs Instruments (YSI) Model 57 dissolved oxygen meter with a submersible probe and calibrated by the Winkler method.

Rainbow and salmon scales were aged with the aid of a Baveco and Lomb microprojector at a magnification of 70X.

Angler preference for rainbow trout management was sampled by contacting individuals fishing on the lake. Anglers were given a fact sheet on the fishery along with a stamped, pre-addressed postcard for indicating their preference on one of three alternatives.

Findings

1979 and 1980 Summer Creel Censuses

Three days and thirteen days of creel census were conducted during the 1979 and 1980 summer fishing seasons respectively. A total of 643 anglers with a harvest of 1967 game fish were interviewed (Table 1). Catch rates in 1980 were approximately double those in 1979, reflecting in part more interviews with salmon fishermen. The summer salmon fishery is a highly localized and specialized fishery characterized by very high catch rates (up to 60 salmon/hour). The partial creel census as conducted is not truly random and the small sample sizes can be easily biased by the inclusion of interviews with salmon fishermen. Future creel surveys should differentiate between trout and salmon fishermen.

Catch rates fell within the range of summer rates for the past five years (9.6-1.4). The average lengths of rainbows (Table 2) have been stable but shorter than desired over the past few years. Kokanee salmon continue to decrease in length while catch rates are still high, indicating continued high densities. A large number of game fish (1873) were checked in 1980 and kokanee made up 52 percent of the harvest. While the season-wide harvest is probably still dominated by rainbows, it is likely that salmon are now a significant portion of the fishery. However, while rainbow growth and catch rates have stabilized, kokanee growth has decreased while catch rates have increased. Inversely density dependent growth appears to be an increasing problem.

A majority of the anglers checked (61%) resided within 40 miles of the lake while another 23% were state residents from farther away and 16% were nonresidents. Although use of Forest Service campgrounds has declined, the distribution of anglers by residence has changed very little over the past five years.

1979-80 and 1980-81 Winter Creel Censuses

A total of 13 days were censused during the two winter seasons. Catch rates in 1979-80 were more than double those in 1980-81 (Table 3). Ice cover ranged from 10 to 32 inches during both seasons with only moderate snowfall. However, a prolonged cold spell in 1979-80 reduced fishing trip lengths with the result that the average daily catch was nearly the same both years (Table 3). The winter season is consistently productive and now produces more than one-fourth of the annual harvest. Resident anglers made up nearly all of the anglers with 59-66% living within 40 miles of the lake and 33-40% living elsewhere in the state. Nonresidents made up only 1% of the anglers checked.

Rainbow trout lengths averaged 11.2 and 9.7 inches in 1979-80 and 1980-81 respectively (Table 4). The smaller size in 1980-81 was due to a large number of 14 inch that were checked and does not reflect a decrease in growth rates. Kokanee lengths, however, are quite small and do reflect a decrease in

Table 1. Angler effort and success during the 1979 and 1980 summer fishing seasons on Georgetown Lake.

Season	Angler Type	No. interviewed	Fish/hour	Fish/day[1/]	Trip length[1/] (hours)
1979	Shore	45	0.7		
1980	Shore	136	0.5	1.6 (29)	3.9 (29)
	Boat	464	2.9	4.7 (64)	3.3 (64)
	Total	600	1.1	3.7 (93)	3.5 (93)

1/ Sample size in parentheses indicates anglers completing trip

Table 2. Composition of the 1979 and 1980 summer angling catches in Georgetown Lake (sample size in parentheses).

Season	Species	Mean length (inches)	Percent of catch
1979	Rainbow trout	10.4 (75)	94 (88)
	Brook trout	10.1 (4)	4 (4)
	Kokanee	--	2 (2)
1980	Rainbow trout	10.9 (251)	41 (774)
	Brook trout	10.8 (40)	7 (124)
	Kokanee	9.2 (99)	52 (977)

Table 3. Angler effort and success during the 1979-80 and 1980-81 winter fishing seasons on Georgetown Lake.

Season	No. interviewed	Fish/hour	Fish/day[1/]	Trip length[1/] (hours)
1979-80	67	4.7	13.9 (15)	3.0 (15)
1980-81	233	2.2	14.7 (57)	5.6 (57)

1/ Sample size in parentheses indicates number of anglers completing trip

Table 4. Composition of angling catches during the 1979-80 and 1980-81 winter fishing seasons on Georgetown Lake (sample size in parentheses)

Season	Species	Mean length (inches)	Percent of catch
1979-80	Rainbow trout	11.2 (30)	18 (141)
	Brook trout	11.8 (2)	1 (11)
	Kokanee	8.2 (7)	81 (645)
1980-81	Rainbow trout	9.7 (124)	34 (730)
	Brook trout	11.1 (22)	6 (123)
	Kokanee	8.4 (127)	60 (1280)

growth rates (Table 4). The average lengths of 8.2 and 8.4 inches were well below the lengths preferred by anglers. A corresponding rise in catch rates indicated that inversely density dependent growth was occurring. Daily limits on salmon were removed in mid-January, 1980 and average daily catches per angler approximately doubled to 60-70 salmon per day. Individual daily catches from 100-240 salmon per day were recorded.

Kokanee and Rainbow Growth Rates

Rainbow trout sustained moderate growth rates in 1979 and 1980 (Table 5). Growth rates have been very stable since age-growth studies were begun in 1976. Unfortunately, growth rate estimates do not exist for the 1950's when the lake produced large numbers of trophy fish ($\geq$ 4 pounds) so there is no way to tell if growth rates have declined in recent years. However, as reported in Job Progress Report F-12-R-25, II-b, angler harvest appears to remove most trout before they have lived 18 months in the lake and this appears to be a dominant factor in the small average size in the creel. Starting in 1978, plants of rainbow trout were reduced by 50,000 fish/year to evaluate the effect of reduced plants on growth rates (Table 6). The numbers of trout planted in May were compared to the mean total length of the trout in the following winter season. At this time the 0+ trout are slightly more than half of the catch and have gone through the summer of their fastest growth. Reducing the plant from 300,000 to 200,000 showed no apparent gains in growth (Table 6). In addition, the plants for 23 years from 1953 to 1975 were compared to mean trout lengths and catch rates in the following summer when the 1+ fish made up the majority of the catch. Numbers of rainbows planted ranged from 13,904 to 375,095. Mean lengths showed a weak negative correlation of -0.14 while catch rates showed a weak positive correlation of 0.23. Neither correlation is significant since $r_{(.95,21)}=0.413$. Since annual harvest may approach 180,000 rainbows it was felt that a plant of 200,000 would reduce catch rates with no apparent increases in growth rates and the plant was increased back to 250,000 trout. Interspecific competition may be occurring with kokanee and the recent liberalization of salmon limits may benefit trout growth. In addition, efforts have been initiated to determine whether other strains of rainbows may be better adapted to the lake environment than the Arlee rainbow which is currently used.

Kokanee generally grow at a slower rate than rainbows (Table 7) and as noted previously average sizes declined significantly in 1978, 1979, and 1980 (Table 8). A corresponding increase in catch rates led to the conclusion that the salmon were overpopulated and stunted. Daily salmon limits were removed entirely in mid-January, 1980, and the summer growth of adults more than tripled (Table 8). However, this management only improves growth through the last year of a three-year life cycle. Initial growth rates appear to be established by year-class strength.

Kokanee spawning in Georgetown takes place primarily in Stuart Mill Creek and in spring areas around the Pumphouse and Denton's Point. Salmon move onto spawning areas around October 20 and spawning takes place through November and December. Fry appear to emerge in late March or April. The Anaconda Mineral Company uses Georgetown Lake as an industrial water supply and normally withdraws water from the lake from December through May. The resulting fluctuations in lake water levels for each year were compared to the growth of the corresponding year classes, using size at spawning as an indicator of population densities.

Table 5. Seasonal growth of rainbow trout year classes in Georgetown Lake, 1979-1981 (Mean total length in inches. Sample size in parentheses).

Year	Month	Year classes 1980	1979	1978	1977	1976	1975
1979	J			9.0 (83)	11.6 (31)	13.3 (6)	14.7 (3)
	F						
	M						
	A						
	M		8.2 (12)	10.4 (45)	12.4 (16)	14.2 (1)	
	J						
	A						
	S		8.5 (31)	11.1 (23)	13.1 (8)		
	O						
	N						
	D						
1980	J		9.1 (65)	11.2 (53)	13.0 (13)		
	F						
	M						
	A		9.9 (18)	12.2 (28)	14.6 (2)		
	M						
	J	7.1 (10)	11.1 (80)	13.4 (17)	13.8 (1)		
	J						
	A						
	S	8.1 (30)	11.5 (49)	13.4 (20)	14.8 (2)	16.3 (2)	
	O						
	N						
	D						
1981	J						
	F	9.3 (55)	12.0 (21)	13.4 (7)	14.3 (8)	15.9 (2)	

Table 6. A comparison of the growth rates versus the number of trout planted for rainbows in Georgetown Lake, 1976-1980 (sample size in parentheses).

Year	No. rainbow planted	Size	Mean length-winter1/
1976	304,400	4-6"	9.9 (7)
1977	300,300	4-6"	9.1 (31)
1978	249,500	4-6"	9.0 (83)
1979	200,000	4-6"	9.1 (65)
1980	261,800	4-6"	9.3 (55)

1/ Mean total length of rainbow trout in January-February following planting

Table 7. Seasonal growth of kokanee year classes in Georgetown Lake, 1977-1981 (mean total length in inches, sample size in parentheses).

Year	Month	Year classes 1979	1978	1977	1976	1975	1974
1977	J				6.7 (1)	9.1 (17)	11.1 (10)
	J				6.8 (7)	9.4 (4)	
	A					10.5 (11)	11.8 (64)
	S						
	O						
	N						11.9 (21)[1/]
	D						
1978	J				7.7 (21)	9.6 (13)	
	F				7.8 (23)	9.8 (21)	
	M						
	A						
	M						
	J				8.1 (15)	10.0 (11)	11.9 (1)
	J						
	A			6.4 (4)		10.6 (16)	
	S						
	O						
	N					10.2 (73)[1/]	
	D						
1979	J						
	F			6.9 (61)	8.7 (104)		
	M						
	A						
	M						
	J						
	J						
	A						
	S						
	O			7.2 (4)	9.3 (40)		
	N				9.3 (118)[1/]		
	D						
1980	J						
	F		7.2 (10)	8.3 (99)	9.1 (1)		
	M						
	A						
	M						
	J						
	J						
	A	7.0 (2)	8.5 (25)	9.5 (106)			
	S						
	O						
	N			10.3 (101)[1/]			
	D						
1981	J	7.7 (45)	8.8 (131)				
	Nov.		10.7 (87)[1/]				

[1/] Size at spawning. The year class is essentially eliminated from the fishery after spawning.

Table 8. Average sizes, catch rates, and growth rates for kokanee in Georgetown Lake, 1975-1981.

Year	Catch rate 1/	Avg. winter length (II+)	Size at spawning (III+)	Summer growth (II+ to III+)	
1975			11.7		
1976			12.2		
1977	1.7		12.0		
1978	2.5	9.6	10.2	0.6	
1979	2.3	8.7	9.2	0.6	
1980	4.6	8.3	10.3	2.0	limits removed
1981	2.2	8.8	10.7	1.9	

1/ Winter catch rate (fish/hour) for all species

to determine whether water withdrawals stranded a sufficient number of redds to influence year class production (Table 9). There does not appear to be any correlation between lake level reductions or minimum lake levels and kokanee growth. Lake level fluctuations were not large; maximum drop, 2.5 feet. The maximum monthly drop was 0.56 feet in January, 1973.

Kokanee and Brook Trout Spawning Surveys

Spawning kokanee were sampled by electrofishing Stuart Mill Creek on 15 November, 1979 and 10 November, 1980. In 1979 males and females averaged 9.4 and 9.3 inches respectively; in 1980, 10.4 and 10.1 inches respectively. Combined average lengths are presented in Table 10. Growth rates improved after daily limits were removed in 1980 and spawning salmon were one inch longer than in 1979.

Stuart Mill Creek is a spring approximately 250-300 yards long flowing at an average discharge of 15-20 cfs. Kokanee utilize essentially all of the stream for spawning substrate. A spawning barrier was installed in 1979 and 1980 in an attempt to block off a portion of the stream and thereby reduce year class production for the stream. The barrier was installed directly below the culvert on the frontage road and blocked approximately 60% of the stream. The barrier was first installed on 30 October, 1979 but vandalism and leaf fall and icing conditions necessitated repairs on 11/6, 11/15, 11/28, and 12/19. All the kokanee above the trap were removed each time by electrofishing but it appeared that a significant amount of spawning took place. The barrier was installed again on 18 October, 1980. Repairs were necessary on 11/10 and 12/5. Kokanee were shocked from the stream each time but some spawning did take place prior to the 12/5 date.

Spawning brook trout were sampled on 30 October, 1979 and 18 October, 1980. Males measured 10.1 and 11.7 inches in 1979 and 1980 respectively and females measured 10.5 and 11.2 inches respectively. Combined lengths are shown in Table 10. Individual lengths vary widely as shown by the large standard deviation. No age-growth information exists for brook trout so it is not known if the variable mean lengths (Table 10) are a function of the population or a sampling problem. Attempts were made to establish abundance indices for kokanee and brook trout by electrofishing the spawning streams.

Table 9. Investigation of lake level fluctuations as a determinant for year class production of kokanee in Georgetown Lake.

Year class	Lake level fluctuations[1] (ft.)	Minimum lake elevation[2]	Year of spawning	Size at spawning
1972	- 1.18	6428.00	1975	11.7
1973	- 2.50	6426.68	1976	12.2
1974	- 1.32	6424.82	1977	12.0
1975	- 1.34	6426.50	1978	10.2
1976	- 1.48	6427.92	1979	9.3
1977	- 0.76	6428.60	1980	10.3
1978	- 1.77	6426.77	1981	10.7

1/ Measured from 1 November to 30 March
2/ Feet above sea level

Table 10. Average total length in inches of spawning kokanee and brook trout from Georgetown Lake, 1975-1980 (both sexes combined).

Year	Kokanee	Brook trout
1975	11.7 (185,0.76)[1]	
1976	12.2 (175,0.51)	11.9 (186,1.66)
1977	12.0 (51,0.67)	10.6 (196,2.03)
1978	10.2 (73,0.77)	9.9 (77,1.96)
1979	9.3 (118,0.39)	10.3 (139,2.21)
1980	10.3 (101,0.36)	11.5 (93,1.90)

1/ Numbers in parentheses (x,y) are the sample size and standard deviation respectively.

Unfortunately both species appear to move in and out of the streams readily and environmental conditions and angling use appear to have a large impact on the number of fish in the streams at any one time. No clear abundance index was established and an upstream fish trap may be the only method available to enumerate the spawning runs.

Rainbow Trout Management

As reported in Job Progress Report F-12-R-35, Job II-b, the small average size of rainbows in the creel was attributed to overharvest by anglers. Discussions with various sportsmen's groups established that a reduction in the daily limit was the most equitable method for reducing harvest. Analysis of past creel census data indicated that three major management strategies were available: 1) maintain the present population with a 10-fish daily limit and 10-11 inch average size, 2) reduce the daily limit to 3 rainbows in an attempt to raise the average size to 14 inches, or 3) establish a trophy-trout fishery with catch-and-release regulations. Approximately 600 anglers on Georgetown Lake were contacted in 1979 and 1980 and presented with a fact sheet on the fishery and a stamped, pre-addressed postcard for indicating their preference for one of the management alternatives. Approximately half or 294 anglers returned the postcards and the results are shown in Table 11. A large majority favored the retention of the current management plan, or alternative 1. Future efforts will be directed toward determining the suitability of various other strains of rainbow for the lake, particularly those strains that might utilize small kokanee as a forage fish. The stocking rate of Arlee rainbow will be maintained at the current rate of 250,000 sub-catchables per year for the present.

Kokanee Management

Kokanee are self-sustaining in the lake and in recent years have become overpopulated and stunted. The factors governing the establishment of year class strength are not known at this time. Elimination of daily limits improved average sizes but only by improving growth in the last year of a three year life-cycle. Kokanee are generally not harvested by anglers until they are age II+.

Attempts were made to control year class production through the control of spawning adults. Limits were removed during the fall snagging season and the season was extended to 31 December. In addition a spawning barrier was erected to block off a portion of the spawning grounds in Stuart Mill Creek. After numerous equipment failures the barrier was finally successfully maintained during the 1981 spawning season. However, Stuart Mill Creek only produces a portion of the salmon in the lake. It appears that overall control of year class strength may only be attained by establishing a piscivorous strain of trout in the lake to utilize kokanee juveniles and thus manipulate kokanee densities and growth rates.

Winter Dissolved Oxygen Sampling

Dissolved oxygen was measured at five stations (Figure 1) on the lake during the winters of 1979-80 and 1980-81. Coordinates for the stations are on file in Region 2 fisheries files.

Table 11. Angler preferance for rainbow trout management alternatives for Georgetown Lake (group percentage in parentheses).

Group	Residence[1]	Alternatives[2] 1	2	3
Summer anglers	1	77	29	2
	2	28	9	2
	3	21	10	1
	Total	126 (70)	48 (27)	5 (3)
Winter anglers	1	21	14	7
	2	19	10	0
	3	2	0	0
	Total	42 (58)	24 (33)	7 (9)
Sportsmen's groups		23 (72)	5 (16)	4 (12)
All respondents		201	77	16
(Percent)		(68)	(26)	(5)

1/ Residence: 1 - Resident living within 40 miles of the lake
2 - Resident living farther than 40 miles from the lake
3 - Nonresident

2/ Alternatives: 1 - 10 trout daily, 10-11" average size
2 - 3 trout daily, 14" average size
3 - Catch-and-release trophy fishery

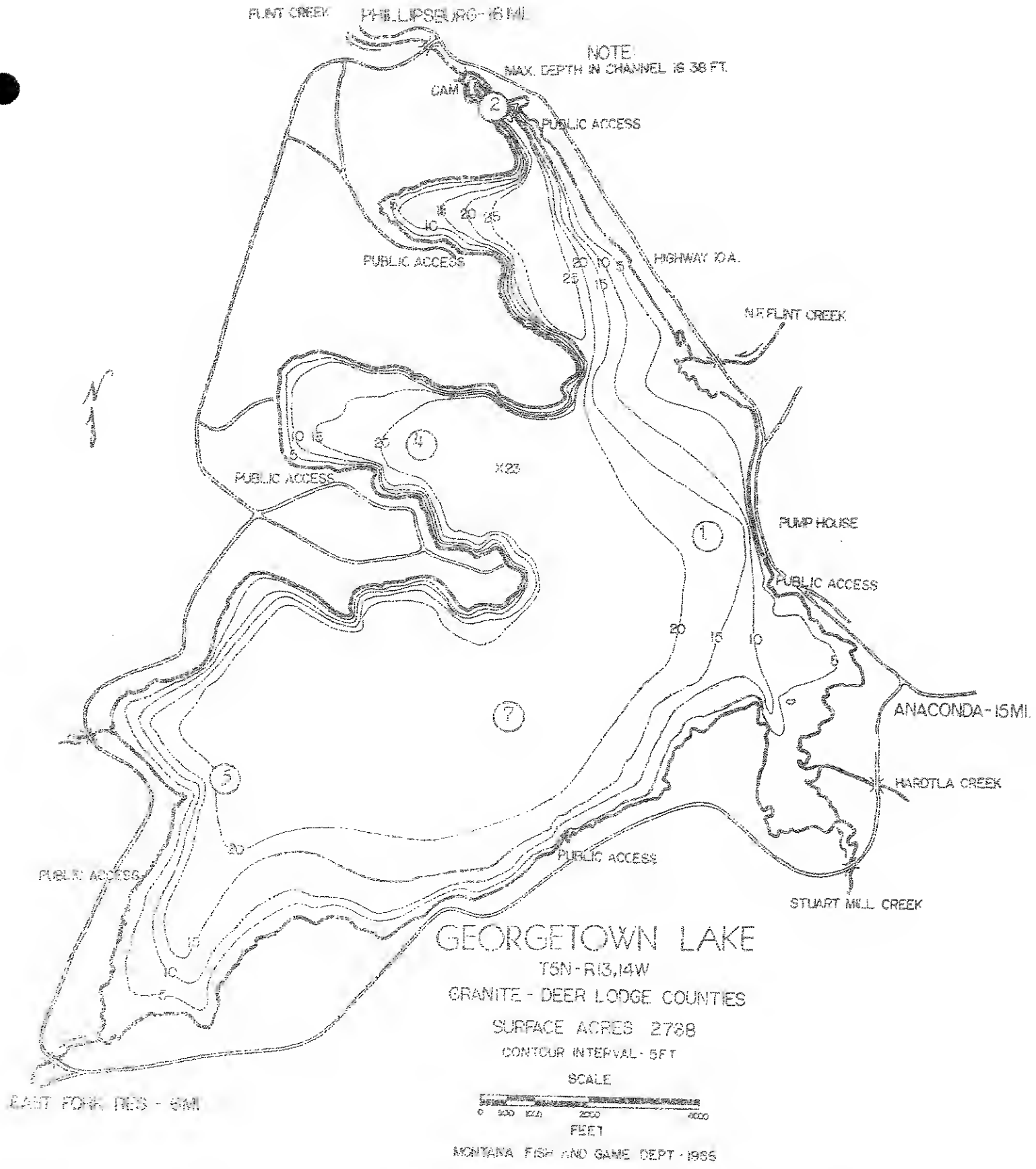

Figure 1. Dissolved oxygen sampling sites on Georgetown Lake, winter 1978-79

Table 12. Dissolved oxygen (mg/l) at five stations on Georgetown during the 1979-80 and 1980-81 winters.

Date	Depth 1/ (meters)	Station 1	2	4	5	7
12-18-79	0	12.0	11.2	12.1		11.8
	1	11.3	8.9	11.2		11.5
	2	10.5	7.6	9.8		11.2
	3	9.9	7.6	6.1		9.6
	4	5.0	4.6	2.8		6.1
	5		4.2	0.5		2.0
	6		3.2			
	7		2.8			
	8		2.2			
3-6-80	0	6.5	8.5	10.6	6.7	9.8
	1	5.4	3.8	4.1	4.8	3.8
	2	4.0	0.1	1.4	0.9	2.8
	3	5.5	0.05	0.1	0.3	2.6
	4	1.2	0.0	0.1	0.2	1.4
	5		0.0	0.1		0.0
	6		0.0			
	7		0.0	ice-out 5-7-80		
2-27-81	0	9.5	9.7	9.6	11.8	11.0
	1	8.6	9.9	5.7	11.2	11.0
	2	8.8	8.6	5.4	6.2	10.8
	3	7.4	5.9	3.0	3.8	10.9
	4	4.1	5.6	1.6	0.3	8.3
	5	1.8	4.2	0.3	0.2	5.8
	6		2.6	0.0	0.1	1.1
	7		1.9			
	8		0.2			
4-29-81			9.6	7.8	7.5	7.2
			7.3	5.9	7.4	5.9
			5.7	5.9	5.6	5.7
			4.3	4.7	3.2	3.4
			4.2	3.0	1.2	3.3
			4.3	1.4	0.3	3.1
			4.5	0.1		0.9
			1.1			
			0.1	ice-out 5-8-81		

1/ Depths measured from the bottom of the ice

There was only a moderate decline in oxygen levels in 1980-81 but a fairly severe decline was recorded in 1979-80. Snow and ice levels totaled more than 32 inches in 1979-80 for a prolonged spell while moderate weather in 1980-81 only produced 20-22 inches of cover. Lake levels also dropped approximately 1.5 feet more in 1979-80 but snow and ice cover was probably the dominant factor in the depletion. Trout and salmon appear to mainly use those portions of 4 mg/l or more of dissolved oxygen. During 1979-80 this would have forced most of the game fish into the upper meter of the lake. However, no special problems with disease or mortality were noted after ice-out (5-7-80).

Pathological Investigations

Several disease outbreaks have been documented in recent years in Georgetown Lake. In June, 1977, anglers complained that rainbow trout had patches of fungus on their sides. Subsequent examination by Thurston Dotson, fish health specialist for DFWP, showed that 30-40 percent of the trout examined showed external signs of infection. Further examination of the trout showed that they were subject to an extremely heavy infestation of the external parasitic trematode Gyrodactylus. The patches of fungus were in fact mucous secretions in response to the irritation caused by the attachment of hundreds of individual flukes. Although the infestation rate was extremely high, no outright mortality was observed and in late summer a number of trout were observed with light colored patches of skin that appeared to be sites of infestation that were now healed. The infestation appeared to be almost entirely restricted to rainbow trout.

On 15 June, 1979 anglers reported large numbers of dead trout along the shoreline. Investigation of the lake on 16 June revealed large numbers of dead or moribund fish. Rainbows were the primary species involved along with a few brook trout and kokanee. Longnose suckers and redside shiners did not appear to be affected. Moribund fish showed no outward physical signs of disease.

Fish health specialist, Jim Peterson, DFWP, performed the pathological investigations on 17 June. He found that the fish were infected with a combination of various parasites and bacteria. Two external parasites were observed, the trematode Gyrodactylus and the protozoan Trichodina. Three internal parasites were evident. The protozoan Hexamita was present in extremely high numbers. Two other parasites, a trematode from the family Allocreadidae and the metacercarial stage of another fluke, Cotylurus erraticus, were also present. Two bacterial pathogens, Aeromonas sp. and Pseudomonas sp., were also found to be causing enteritis in the lower gut. It appears that the combination of the infestation of Hexamita and the fluke Allocreadidae along with the bacterial enteritis of the lower gut were the major factors in the kill (Peterson, 1979).

The conditions leading to the disease outbreak are not evident. The lake had only moderate oxygen depletions in the preceding winter. The lake was in the process of turning over and 200,000 rainbows had been planted the week before. However, all these conditions occur each spring and it is not clear why all the pathogen populations peaked at that particular time. The fish kill involved an estimated 5-10,000 game fish, approximately 1-2 percent of the lake's population, so the outright impact on the fishery was not severe. Anglers virtually stopped using the lake for a period of 4-8 weeks in spite of media releases disclaiming any danger to human health. The decrease in angler harvest probably compensated for the number of fish lost to disease.

Routine pathological examination on 16 October, 1979, of the brook trout spawning in the North Fork of Flint Creek revealed the presence of two bacteria, Corynebacterium salmoninus (bacterial kidney disease) and Yersinia ruckeri (enteric red mouth). This was the first time these two bacteria were documented in the lake and the first documentation of red mouth in the state (Peterson, 1979). The brook trout are no longer being used as a wild broodstock due to the presence of these pathogens.

Recommendations

The fishery should continue to be monitored through angler creel census and by sampling game fish in the lake and spawning tributaries. Creel censuses should distinguish between trout and salmon fishermen to eliminate biases in the data. Efforts should be directed at determining the suitability of various strains of rainbow trout for the lake environment, particularly strains that would pray on young kokanee.

Dissolved oxygen should continue to be monitored during periods of ice-cover to aid in future management decisions on lake level fluctuations.

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Bibliography

Peterson, J. 1979. Personal Communication. Fish pathology investigations, Georgetown Lake.

Vashro, J.E. 1980. Investigations of more important waters, Georgetown Lake management survey. Job Progress Report, Federal Aid in Fish and Wildlife Restoration Acts. Montana Project F-12-R-23, Job No. II-6. 12 pp.

Waters referred to:
2-06-7961-S Georgetown Lake

Key words:
Fisherman preference survey
Water level fluctuation
Kokanee spawning
Stocking
Parasite/Disease